basics and decay graph

isotope - same protons different neutrons
A - mass number (total particles)
Z - atomic number (total protons)
N = A - Z
on the decay graph:
- isotopes near the bottom tend to emit B+/-
- isotopes near the top are alpha emitters
more neutrons = more unstable = more likely to decay

binding energy curve

****make sure to know the key points on this graph**
- iron is the most stable as it has the highest binding energy (at the top of the curve)
- if youre moving from lower binding energy to higher (--> on graph till iron) then energy is released from fusion
- if youre moving from lower binding energy to higher (<-- on the graph from uranium to iron) then energy is being released from fission

Reactors

composed of uranium-235 fuel rods with moderators on the inside, eg. water, graphite.
the moderators slow down the neutrons to thermal speeds to allow them to be absorbed by the fuel rods (otherwise they would reflect off the rods)
the control rods between the fuel rods (boron) absorb neutrons completely without cuasing anymore reactions (like an on/off switch)
coolant is CO2 fluid that takes heat away from the rods and takes it to the boiler which heats the water and in turn turns it into steam to turn the turbine.

binding energy and reactions

binding energy = energy required to separate a nucleus into its consitutents part
higher binding energy/higher binding energy per nucleon = more stable
a nucleus is lighter than its constiuent parts.
>> this is due to energy in the form of mass being used to separate the particles
mass **defect** = change in mass from nucleus to consituent parts (*fusion*)
mass **difference** = mass difference between nucleus and fission fragments (*fission*)
$E = mc^2$
or
mass defect (in u) x 931.5MeV = Energy
Fission:
- occurs when a nucleus collides with neutrons
- forms a daughter nucleus as well as 2-3 more neutrons which therefore cause a chain reaction